

Amendments to the Claims:

Please cancel claim 2, amend claims 1, 21, 22, 25, 27, 28, and 29, and add new claims 32-67, all as shown below.

All pending claims are reproduced below, including those that remain unchanged.

1. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a flow of ~~reactive a~~ species into the ~~annulus~~ center of the annular plasma to create reactive species; and
using reactive atom plasma processing for the damage-free shaping of a surface.
2. (Canceled).
3. (Original) The method of claim 1 for shaping optical elements.
4. (Original) The method of claim 1 for shaping elements out of silicon.
5. (Original) The method of claim 1 for shaping silica glass optics.
6. (Original) The method of claim 1 for shaping aspheric optics.
7. (Original) The method of claim 1 operating in a subtractive manner.
8. (Original) The method of claim 1 that does not leave behind a contaminated redeposition layer.
9. (Original) The method of claim 1 using a plume of plasma.
10. (Original) The method of claim 1 using a plume of plasma operating as a sub-aperture tool.

11. (Original) The method of claim 1 wherein a plume of plasma is translated across a workpiece.
12. (Original) The method of claim 1 wherein the emission spectrum is monitored to determine process rates.
13. (Original) The method of claim 1 using carbon tetrafluoride (CF₄) in argon to create the plasma.
14. (Original) The method of claim 1 using C₂F₆ in argon to create the plasma.
15. (Previously presented) The method of claim 1 using sulfur hexafluoride (SF₆) in argon to create the plasma.
16. (Canceled).
17. (Canceled).
18. (Original) The method of claim 1 operating an additive manner.
19. (Previously presented) The method of claim 1 for removing damage introduced by previous process steps.
20. (Original) The method of claim 1 for removing surface roughness.
21. (Currently amended) A method for shaping surfaces, comprising:
injecting a flow of ~~reactive~~ a species into the ~~annulus~~ center of an annular plasma to create reactive species; and

using reactive atom plasma processing to shape and polish a surface.

22. (Currently amended) A method for shaping surfaces, comprising:
injecting a flow of reactive a species into the ~~annulus~~ center of an annular plasma to
create reactive species; and
using reactive atom plasma processing for the damage-free shaping of a surface at
about atmospheric pressure.
23. (Previously presented) A method for shaping surfaces, comprising:
using reactive atom plasma processing for the damage-free shaping of a surface;
wherein said using step includes using a flow of auxiliary gas to effect a flow of
reactive gas before the reactive gas is injected into the annulus of an annular plasma.
24. (Previously presented) A method for shaping surfaces, comprising:
generating an annular plasma;
injecting a flow of reactive gas into the center of the annular plasma; and
using reactive atom plasma processing to shape a surface at about atmospheric
pressure.
25. (Currently amended) A method for shaping surfaces, comprising:
creating an annular plasma having a central zone;
injecting a ~~reactive~~ species into the central zone of the annular plasma to create
reactive species; and
using reactive atom plasma processing for the damage-free shaping of a surface.
26. (Previously presented) A method for shaping surfaces, comprising:
creating a plasma a distance from the tip of a plasma torch, the plasma having a skin;
injecting a flow of reactive gas through the skin of the plasma such that the reactive
species begins to dissociate; and

using reactive atom plasma processing for the damage-free shaping of a surface.

27. (Currently amended) A method for shaping surfaces, comprising:
creating a torroidal plasma;
injecting a ~~reactive~~ species into center of the torroidal plasma to create reactive species; and
using reactive atom plasma processing for the damage-free shaping of a surface.
28. (Currently amended) A method for shaping surfaces, comprising:
injecting a flow of ~~reactive~~ a species into the ~~annulus~~ center of an annular plasma to create reactive species; and
using reactive atom plasma processing to shape and finish a surface.
29. (Currently amended) A method for shaping surfaces, comprising:
injecting a flow of ~~reactive~~ a species into the ~~annulus~~ center of an annular plasma to create reactive species; and
using reactive atom plasma processing to shape a surface while reducing the surface roughness.
30. (Previously presented) A method for shaping surfaces, comprising:
injecting a flow of reactive gas into the annulus of an annular plasma; and
using reactive atom plasma processing for the damage-free shaping of a surface;
wherein said using step includes using a flow of auxiliary gas to keep heat from the annular plasma away from the reactive gas before the reactive gas contacts the plasma.
31. (Previously presented) A method for shaping surfaces, comprising:
generating an annular plasma;
injecting a flow of reactive gas into the center of the annular plasma; and

using reactive atom plasma processing to shape a surface.

32. (New) The method of claim 1, further comprising:
using the species which has been selected in order to react with selected materials
which comprise the surface.
33. (New) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a flow of a species into the center of the annular plasma to create reactive
species; and
shaping a surface damage-free via a chemical reaction between the flow of reactive
species and the surface.
34. (New) A method for shaping surfaces, comprising:
creating a plasma having an internal zone;
injecting a flow of a species into the internal zone of the plasma to create reactive
species; and
shaping a surface via chemical reaction between the flow of reactive species and the
surface.
35. (New) A method for shaping surfaces, comprising:
creating a plasma having an internal zone;
injecting a flow of a species into the internal zone of the plasma to create reactive
species; and
using reactive atom plasma processing for the shaping of a surface.
36. (New) A method to shape a surface, comprising:
creating an annular plasma;
using a species which has been selected in order to react with selected materials

which comprise the surface;

injecting a flow of the species into the center of the annular plasma or into the body of a non-annular system to create reactive species; and

using reactive atom plasma processing to selectively shape the surface by allowing the reactive species to react with the selected materials which comprise the surface.

37. (New) The method of claim 36 including the step of moving at least one of the plasma and the surface relative to the other.

38. (New) A method to shape a surface, comprising:

creating a plasma;

using a species which has been selected in order to react with selected materials which comprise the surface;

injecting a flow of the species into the center of the plasma to create reactive species;

and

using reactive atom plasma processing to selectively shape the surface by allowing the reactive species to react with the selected materials which comprise the surface.

39. (New) The method of claim 38 including the step of moving at least one of the plasma and the surface relative to the other.

40. (New) A method to shape a surface, comprising:

creating a plasma;

using a species which has been selected in order to react with selected materials which comprise the surface and which reactive species does not react with other materials of the surface;

injecting a flow of the species into the center of the plasma to create reactive species;

and

using reactive atom plasma processing to selectively shape the surface by allowing

the reactive species to react with the selected materials which comprise the surface without reacting with other materials of the surface.

41. (New) A method to clean a surface, comprising:
creating a plasma;
using a species which has been selected in order to react with selected materials which comprise the surface and which reactive species does not react with other materials of the surface;
injecting a flow of the species into the center of the plasma to create reactive species;
and
using reactive atom plasma processing to selectively clean the surface by allowing the reactive species to react with the selected materials which comprise the surface without reacting with other materials of the surface.
42. (New) The method of claim 41 including the step of moving at least one of the plasma and the surface relative to the other.
43. (New) A method to shape a surface, comprising:
creating a plasma;
using a species which has been selected in order to react with selected materials which comprise the surface and which reactive species does not react with other materials of the surface;
injecting a flow of the species into the center of the plasma to create reactive species;
and
controlling which materials of the surface are shaped by the use of the selected reactive species in reactive atom plasma processing to selectively shape the surface by allowing the reactive species to react with all or selected materials which comprise the surface without reacting with other materials of the surface not intended for removal.

44. (New) The method of claim 36 operated at one of above and below atmospheric pressure.
45. (New) The method of claim 38 operated at one of above and below atmospheric pressure.
46. (New) The method of claim 41 operated at one of above and below atmospheric pressure.
47. (New) The method of claim 43 operated at one of above and below atmospheric pressure.
48. (New) The method of claim 36 operable on one of a conductive surface, a non-conductive surface, and a semiconductor surface.
49. (New) The method of claim 38 operable on one of a conductive surface, a non-conductive surface, and a semiconductor surface.
50. (New) The method of claim 41 operable on one of a conductive surface, a non-conductive surface, and a semiconductor surface.
51. (New) The method of claim 43 operable on one of a conductive surface, a non-conductive surface, and a semiconductor surface.
52. (New) The method of claim 36 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively in one of an additive mode and a subtractive mode.
53. (New) The method of claim 38 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively in one of an additive mode and a subtractive mode.

54. (New) The method of claim 41 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively in one of an additive mode and a subtractive mode.
55. (New) The method of claim 43 wherein the step of using reactive atom plasma processing to selectively shape the surface is a deterministic step which can be selectively in one of an additive mode and a subtractive mode.
56. (New) The method of claim 36 operated at about atmospheric pressure and at one of above and below room temperature.
57. (New) The method of claim 38 operated at about atmospheric pressure and at one of above and below room temperature.
58. (New) The method of claim 41 operated at about atmospheric pressure and at one of above and below room temperature.
59. (New) The method of claim 43 operated at about atmospheric pressure and at one of above and below room temperature.
60. (New) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a flow of a species into the center of the annular plasma to create reactive species; and
using reactive atom plasma processing for the damage-free shaping of a surface to fit a pre-determined contour.
61. (New) A method for shaping surfaces, comprising:
creating an plasma;

injecting a flow of a species into the center of the plasma to create reactive species;
and
using reactive atom plasma processing for the damage-free shaping of a surface to fit
a pre-determined contour.

62. (New) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a flow of a species into the center of the annular plasma to create reactive
species; and
shaping a surface deterministically and damage-free to fit a pre-determined contour.
63. (New) A method for shaping surfaces, comprising:
creating an plasma;
injecting a flow of a species into the center of the plasma to create reactive species;
and
shaping a surface deterministically and damage-free to fit a pre-determined contour.
64. (New) A method for shaping surfaces, comprising:
creating an annular plasma;
injecting a flow of a species into the center of the annular plasma to create reactive
species; and
using reactive atom plasma processing for the damage-free and deterministic shaping
of a surface by at least one of:
selecting a part of the surface to shape;
selecting a material to shape on the surface; and
controlling the removal rate of a material on the surface under shaping.
65. (New) A method for shaping surfaces, comprising:
creating an plasma;

injecting a flow of a species into the center of the plasma to create reactive species;
and

using reactive atom plasma processing for the damage-free and deterministic shaping
of a surface by at least one of:

- selecting a part of the surface to shape;
- selecting a material to shape on the surface; and
- controlling the removal rate of a material on the surface under shaping.

66. (New) A method for shaping surfaces, comprising:

creating an annular plasma;
injecting a flow of a species into the center of the annular plasma to create reactive
species; and

shaping a surface deterministically and damage-free by at least one of:

- selecting a part of the surface to shape;
- selecting a material to shape on the surface; and
- controlling the removal rate of a material on the surface under shaping.

67. (New) A method for shaping surfaces, comprising:

creating an plasma;
injecting a flow of a species into the center of the plasma to create reactive species;
and

shaping a surface deterministically and damage-free by at least one of:

- selecting a part of the surface to shape;
- selecting a material to shape on the surface; and
- controlling the removal rate of a material on the surface under shaping.